

WHAT IS CLAIMED IS:

1. A moving object detection device, detecting, from a plurality of taken images of image-taken objects taken by a plurality of synchronized image pickup means, moving objects  
5 existing among the image-taken objects, comprising:

a distance information generating means, generating distance information in the form of distances to the image-taken objects based on the parallaxes of the plurality of taken images;

10 a movement information generating means, generating movement information in the form of movements of the moving objects based on the differences of taken images input in time series from at least one of the image pickup means among the plurality of image pickup means;

15 an object distance setting means, setting, based on the distance information and the movement information, an object distance at which an abovementioned moving object exists;

an object distance image generating means, generating, based on the distance information, an object distance image  
20 comprising pixels corresponding to the object distance set by the object distance setting means;

an object region setting means, setting, within the object distance image and in correspondence to at least the object distance, an object region to be subject to the detection  
25 of an abovementioned moving object; and

a contour extraction means, extracting a contour from the

object region set by the object region setting means and thereby detecting the abovementioned moving object.

2. The moving object detection device according to Claim 1, wherein the object distance setting means determines,  
5 according to distance, the totals of pixels with which there is movement, and sets the object distance, at which an abovementioned moving object exists, based on these totals.

3. The moving object detection device according to Claim 1, wherein the object distance image generating means generates  
10 an object distance image comprising pixels that exist within a predetermined range in the depth direction based on at least the object distance.

4. The moving object detection device according to Claim 1, wherein the object region setting means sets, based on pixel  
15 amounts in the vertical direction in the object distance image, the object region within a predetermined range in the horizontal direction from the peak of the pixel amounts.

5. The moving object detection device according to Claim 1, wherein the object region setting means sets the vertical  
20 direction range of the object region based on at least the tilt angle and the height from the installation surface of the image pickup means.

6. The moving object detection device according to Claim 1, further comprising: an edge image generating means,  
25 generating an edge image by extracting edges from an abovementioned taken image based on the color information or

gray scale information of the respective pixels of the taken image; wherein the object distance image generating means extracts, based on the distance information, pixels of the edge image that correspond to the object distance to generate the  
5 object distance image.

7. The moving object detection device according to Claim 1, further comprising: a distance information renewal means, renewing the distance information upon deeming the internal region of the contour extracted by the contour extraction means  
10 as a region from which the moving object has been extracted.

8. A moving object detection method, by which moving objects with movement are detected from among image-taken objects based on distance information, concerning distances to the image-taken objects and generated based on taken images  
15 taken by a plurality of synchronized image pickup means, and movement information, generated based on taken images input in time series from at least one of the image pickup means among the plurality of image pickup means, comprising:

an object distance setting step of setting, based on the  
20 distance information and the movement information, an object distance at which an abovementioned moving object exists;

an object distance image generating step of generating, based on the distance information, an object distance image comprising pixels corresponding to the object distance set in  
25 the object distance setting step;

an object region setting step of setting, within the

object distance image and in correspondence to at least the object distance, an object region to be subject to the detection of an abovementioned moving object; and

5 a contour extraction step of extracting a contour from the object region set in the object region setting step and thereby detecting the abovementioned moving object.

9. A moving object detection program, which, in order to detect moving objects with movement from among image-taken objects based on distance information, concerning distances to the image-taken objects and generated based on taken images  
10 taken by a plurality of synchronized image pickup means, and movement information, generated based on taken images input in time series from at least one of the image pickup means among the plurality of image pickup means, makes a computer function  
15 as:

an object distance setting means, setting, based on the distance information and the movement information, an object distance at which an abovementioned moving object exists;

an object distance image generating means, generating,  
20 based on the distance information, an object distance image comprising pixels corresponding to the object distance set by the object distance setting means;

an object region setting means, setting, within the object distance image and in correspondence to at least the  
25 object distance, an object region to be subject to the detection of an abovementioned moving object; and

a contour extraction means, extracting a contour from the object region set by the object region setting means and thereby detecting the abovementioned moving object.

10. A moving object detection device, detecting, from a  
5 plurality of taken images of image-taken objects taken by a plurality of synchronized image pickup means, moving objects existing among the image-taken objects, comprising:

a distance information generating means, generating distance information in the form of distances to the  
10 image-taken objects based on the parallaxes of the plurality of taken images;

a movement information generating means, generating movement information in the form of movements of the moving objects based on the differences of taken images input in time  
15 series from at least one of the image pickup means among the plurality of image pickup means;

an object approach judging means, judging, based on the differences of the distance information generated at predetermined time intervals, whether or not abovementioned  
20 moving objects are approaching the image pickup means;

an object distance setting means, setting, based on the distance information and the movement information, an object distance at which an abovementioned moving object exists in the case where the judgment result of the object approach judgment  
25 means indicates that abovementioned moving objects are approaching the image pickup means;

an object distance image generating means, generating, based on the distance information, an object distance image comprising pixels corresponding to the object distance set by the object distance setting means;

5        an object region setting means, setting, within the object distance image and in correspondence to at least the object distance, an object region to be subject to the detection of an abovementioned moving object; and

10       a contour extraction means, extracting a contour from the object region set by the object region setting means and thereby detecting the abovementioned moving object.

11. The moving object detection device according to Claim 10, wherein the object distance setting means sets the object distance by providing the distance, for which the total of the pixels with movement is the greatest, with a width in the depth direction, within which abovementioned moving objects exist, based on the differences of the distance information generated at predetermined time intervals.

12. The moving object detection device according to Claim 10, wherein the object region setting means measures pixel amounts in the vertical direction in each of a plurality of object distance images generated by the object distance image generating means, specifies the movement direction of an abovementioned moving object based on the positions at which the pixel amounts peak in the respective abovementioned object distance images, and sets a priorly determined horizontal

direction width in correspondence to the movement direction as the horizontal direction range of the abovementioned moving object.

13. The moving object detection device according to Claim  
5 10, wherein the object region setting means sets the vertical direction range of the object region based on at least the tilt angle and the height from the installation surface of the image pickup means.

14. The moving object detection device according to Claim  
10 10, further comprising: an edge image generating means, generating an edge image by extracting edges from an abovementioned taken image based on the color information or gray scale information of the respective pixels of the taken image; wherein the object distance image generating means  
15 extracts, based on the distance information, pixels of the edge image that correspond to the object distance to generate the object distance image.

15. A moving object detection method, by which moving objects with movement are detected from among image-taken  
20 objects based on distance information, concerning distances to the image-taken objects and generated based on taken images taken by a plurality of synchronized image pickup means, and movement information, generated based on taken images input in time series from at least one of the image pickup means among  
25 the plurality of image pickup means, comprising:

an object approach judging step of judging, based on the

differences of the distance information generated at predetermined time intervals, whether or not abovementioned moving objects are approaching the image pickup means;

an object distance setting step of setting, based on the  
5 distance information and the movement information, an object distance at which an abovementioned moving object exists in the case where the judgment result of the object approach judgment step indicates that abovementioned moving objects are approaching the image pickup means;

10 an object distance image generating step of generating, based on the distance information, an object distance image comprising pixels corresponding to the object distance set in the object distance setting step;

an object region setting step of setting, within the  
15 object distance image and in correspondence to at least the object distance, an object region to be subject to the detection of an abovementioned moving object; and

a contour extraction step of extracting a contour from the object region set in the object region setting step and  
20 thereby detecting the abovementioned moving object.

16. A moving object detection program, which, in order to detect moving objects with movement from among image-taken objects based on distance information, concerning distances to the image-taken objects and generated based on taken images  
25 taken by a plurality of synchronized image pickup means, and movement information, generated based on taken images input in



time series from at least one of the image pickup means among the plurality of image pickup means, makes a computer function as:

an object approach judging means, judging, based on the  
5 differences of the distance information generated at predetermined time intervals, whether or not abovementioned moving objects are approaching the image pickup means;

an object distance setting means, setting an object  
distance at which an abovementioned moving object exists based  
10 on the distance information and the movement information in the case where the judgment result of the object approach judgment means indicates that abovementioned moving objects are approaching the image pickup means;

an object distance image generating means, generating,  
15 based on the distance information, an object distance image comprising pixels corresponding to the object distance set by the object distance setting means;

an object region setting means, setting, within the  
object distance image and in correspondence to at least the  
20 object distance, an object region to be subject to the detection of an abovementioned moving object; and

a contour extraction means, extracting a contour from the  
object region set by the object region setting means and thereby  
detecting the abovementioned moving object.